MISO Transmission Expansion Plan: MTEP21 Addendum - LRTP Tranche 1 Portfolio Feedback Review

Planning Advisory Committee (PAC)

May 27, 2022

*Updated 5/25: slide 21 & 22 to read that feedback is from "MISO South TOs"

Purpose & Key Takeaways

Purpose:

- Provide a summary of the MTEP21 Addendum
- Review stakeholder feedback and MISO's response
- Seek PAC motion to forward MTEP21 Report Addendum

Key Takeaways:

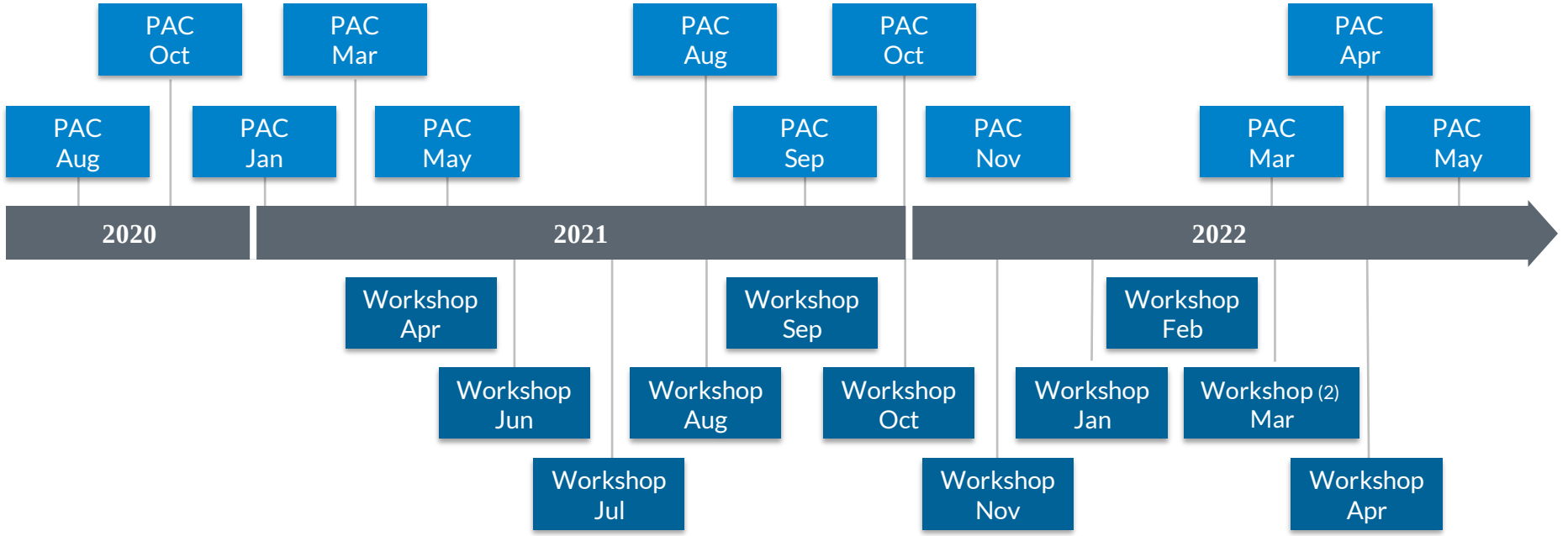
- Draft of the MTEP21 Addendum: LRTP Tranche 1 Portfolio Report was posted on 4/12/22; Feedback was requested
- MISO responses to feedback included as App F and posted to MISO website
- MISO will present MTEP21 LRTP Addendum for Board of Director approval on July 25, 2022

Stakeholder input has been critical and numerous meetings have provided opportunities for strong engagement throughout the process

Tranche 1 is the culmination of approximately:

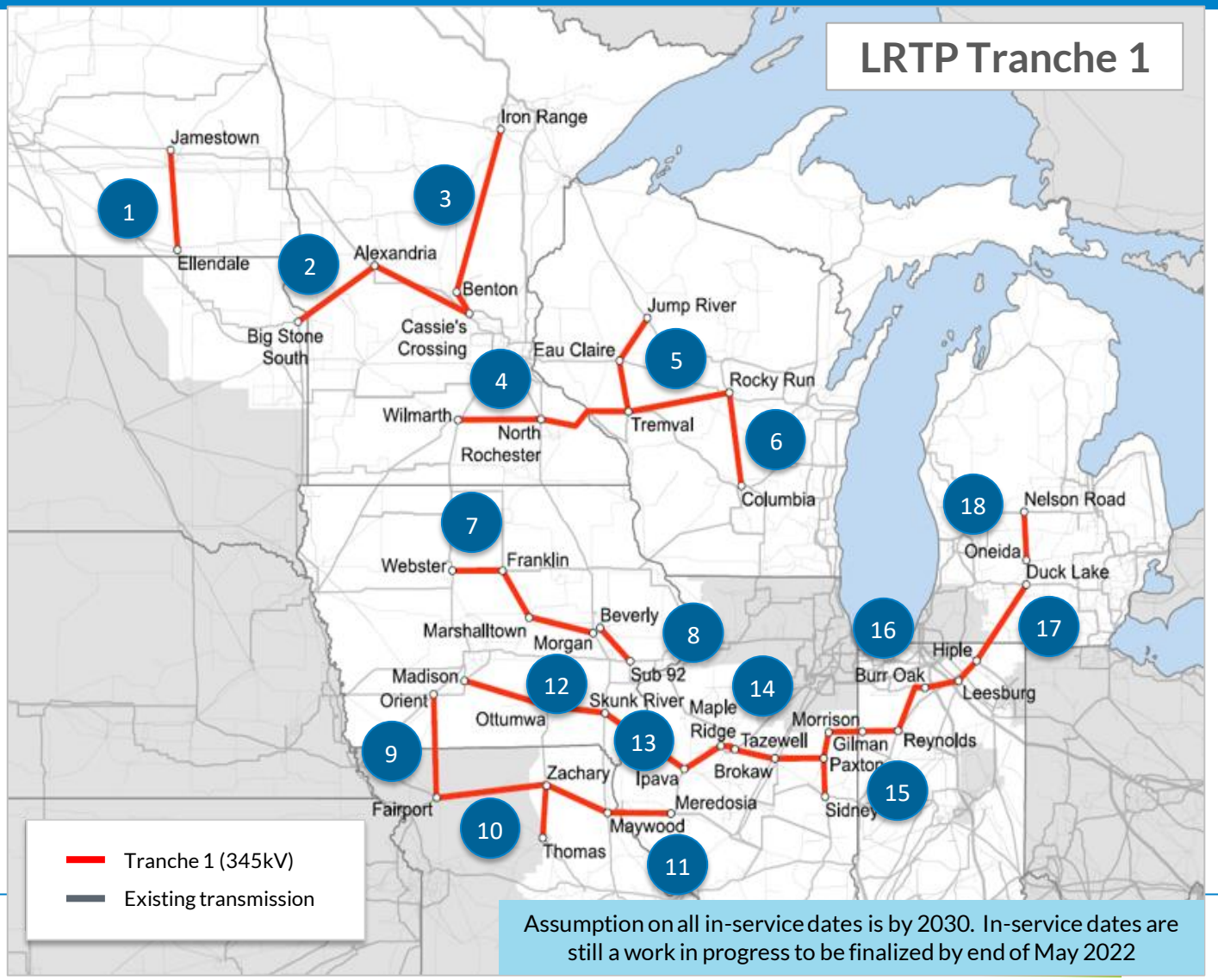
200+ internal and external meetings

200 - 300 attendees at each external meeting and workshop



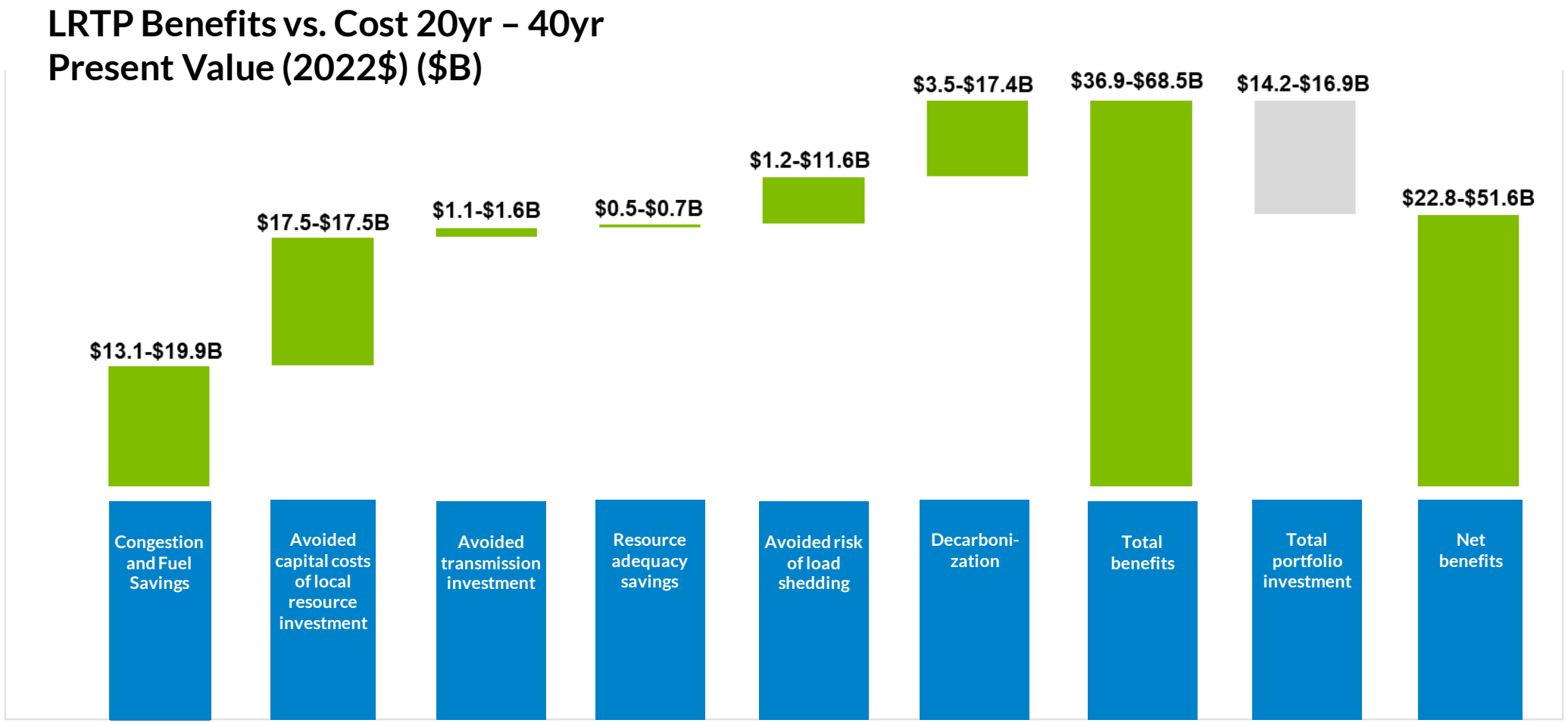
Preliminary project cost estimates for LRTP Tranche 1 is $10.4 B for projects located across the MISO Midwest subregion

ID	Project Description	Est. Cost ($M, 2022)
1	Jamestown – Ellendale	$420M
2	Big Stone South – Alexandria – Cassie's Crossing	$595M
3	Iron Range – Benton County – Cassie's Crossing	$853M
4	Wilmarth – North Rochester – Tremval	$718M
5	Tremval – Eau Clair – Jump River	$575M
6	Tremval – Rocky Run – Columbia	$673M
7	Webster – Franklin – Marshalltown – Morgan Valley	$716M
8	Beverly – Sub 92	$178M
9	Orient – Denny - Fairport	$561M
10	Denny – Zachary – Thomas Hill – Maywood	$1,115M
11	Maywood – Meredosia	$356M
12	Madison – Ottumwa – Skunk River	$683M
13	Skunk River – Ipava	$600M
14	Ipava – Maple Ridge – Tazewell – Brokaw – Paxton East	$640M
15	Sidney – Paxson East – Gilman South – Morrison Ditch	$533M
16	Morrison Ditch – Reynolds – Burr Oak – Leesburg – Hiple	$374M
17	Hiple – Duck Lake	$488M
18	Oneida – Nelson Rd.	$302M
	Total Project Portfolio Cost	**$10,380**



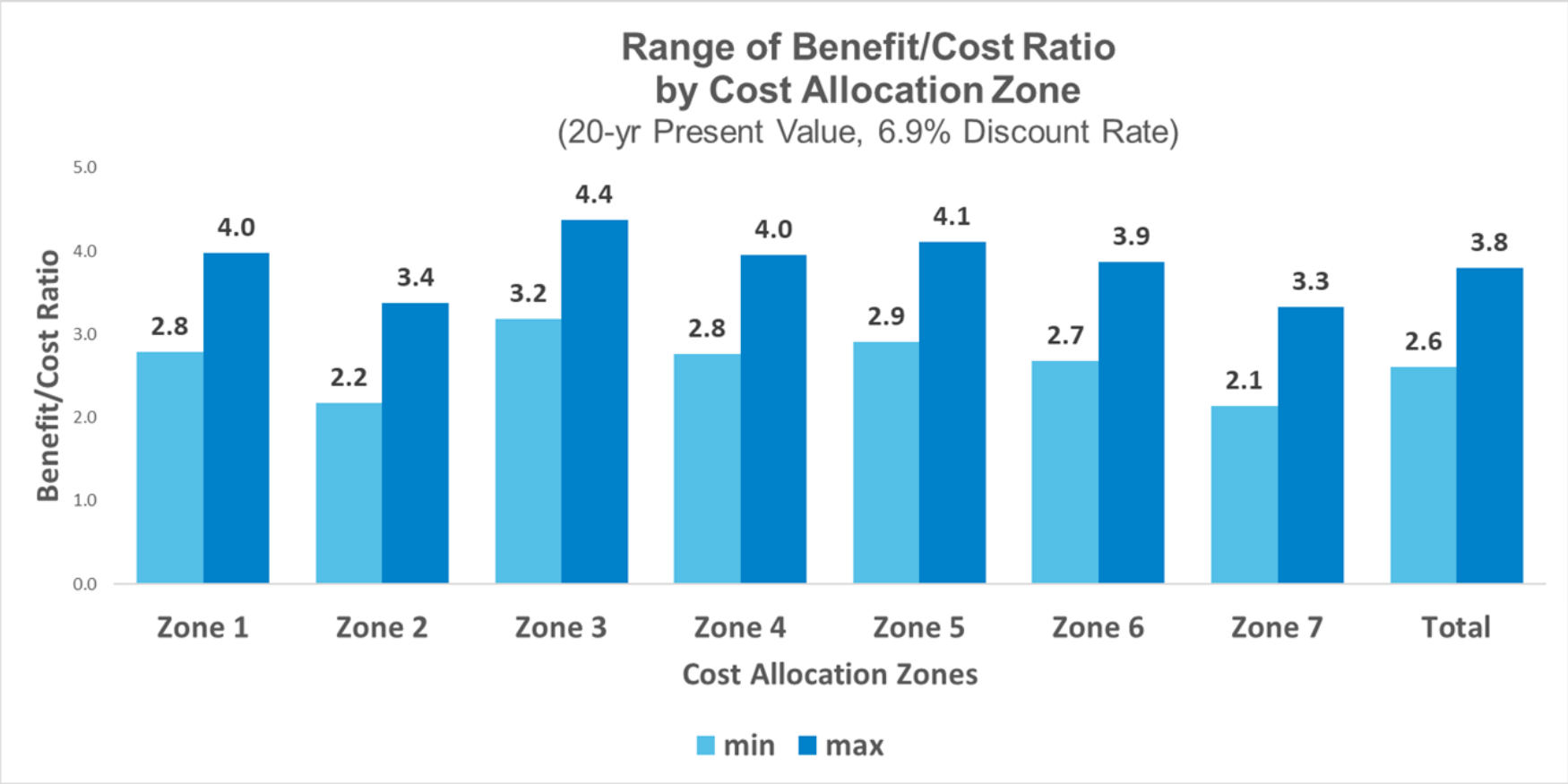
Costs as of 4/6/2022, and are subject to change
(costs represent "overnight" costs)

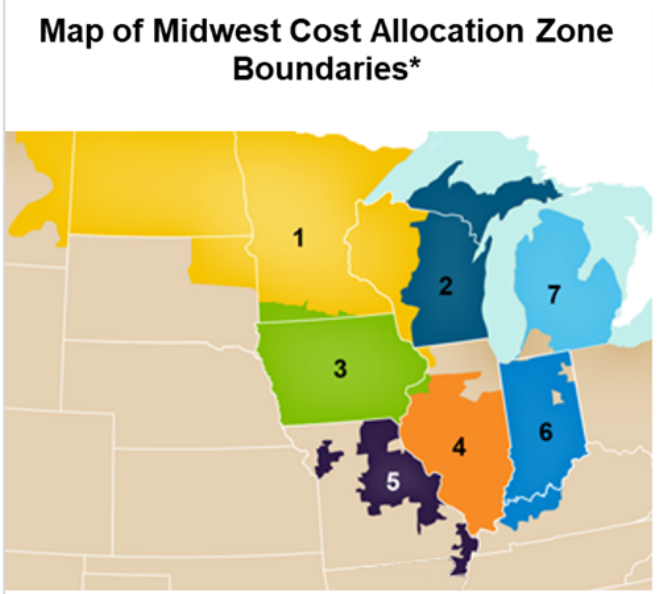
The preliminary analysis indicates total economic benefits significantly exceed cost of the Tranche 1 LRTP portfolio



Values as of 4/6/2022
*6.9% Discount Rate

Tranche 1 provides broad distribution of benefits across the Midwest subregion and delivers a benefit to cost ratio at least 2.1 for all zones

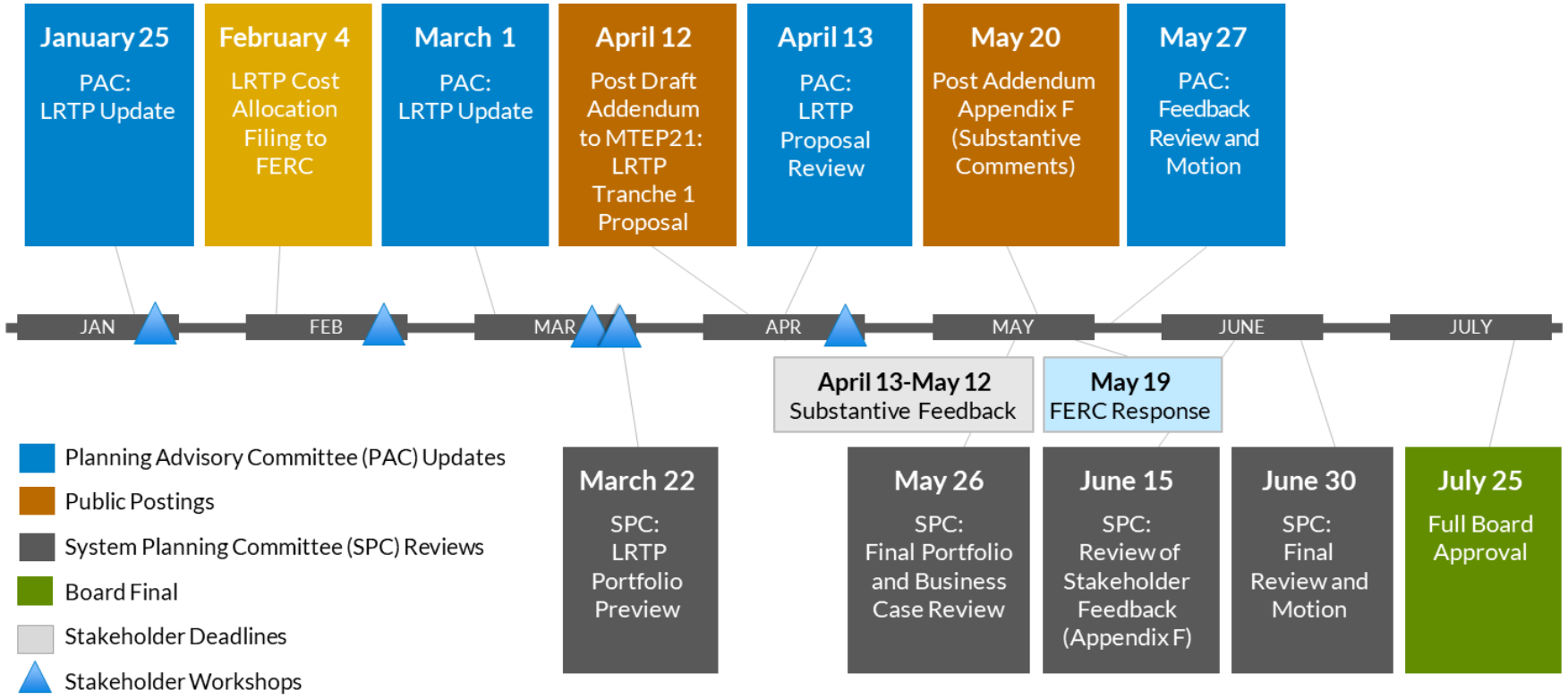




*MISO Tariff, Attachment WW

Values as of 4/6/2022

The timeline for approval of Tranche 1 is targeted for July 25



Substantive Stakeholder Feedback Summary and MISO Response Review

MISO Received 15 Substantive Feedback Submission from the following Sectors and Stakeholders

- Ameren
- Certain MISO TOs:
  - Ameren Missouri
  - Ameren Illinois
  - Ameren Transmission Company of Illinois
  - ITC Transmission
  - ITC Midwest LLC
  - Michigan Electric Transmission Company LLC
  - MidAmerican Energy Company
  - Northern States Power MN-subsidiary of Xcel Energy Inc.
  - Northern States Power WI -subsidiary of Xcel Energy Inc. Otter Tail Power Company
- DTE Energy
- Eligible End Use Customers Sector
- Environmental Sector
- Invenergy LLC
- Iowa Office of Consumer Advocate
- ITC Companies
- MidAmerican Energy Company
- MISO South TOs:
  - Arkansas Electric Cooperative Corporation
  - Cleco Power, LLC
  - Cooperative Energy
  - Entergy Arkansas, LLC
  - Entergy Louisiana, LLC
  - Entergy Mississippi, LLC
  - Entergy New Orleans, LLC
  - Entergy Texas
- Missouri River Energy Services
- Municipals/Cooperatives/and Transmission Dependent Utilities Sector
- National Grid Renewables
- Otter Tail Power Company
- WPPI Energy

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response

The following MISO Stakeholders submitted substantive feedback outlining support of the LRTP Tranche 1 Portfolio of projects:
• Ameren
• ITC Companies
• MidAmerican Energy Company
• Otter Tail Power Company
• Certain MISO TOs:
  • ITC Transmission
  • Michigan Electric LLC
  • ITC Midwest LLC
  • Otter Tail Power Company
  • MidAmerican Energy Company
  • Ameren Missouri
  • Ameren Illinois
  • Ameren Transmission Company of Illinois Northern States Power MN (subsidiary of Xcel Energy Inc)
  • Northern States Power WI (subsidiary of Xcel Energy Inc)
	MISO staff appreciates these comments and support of the MTEP21 Addendum and LRTP process for Tranche 1 portfolio.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
National Grid Renewables Comment: MISO should reconsider including Hazel Creek to Blue Lake 345 kV corridor line in the Tranche 1 portfolio.	MISO did consider this project in the LRTP Tranche 1 study effort as an alternative to identified issues in the North Dakota and western Minnesota area. It was not chosen as a solution as it did not perform as well as the chosen project for that area (refer to LRTP Workshop - February 25, 2022). MISO will be looking at this corridor again in the LRTP Tranche 2 study efforts.
WPPI Energy Stakeholder Comment: WPPI believes 250 MW approximate increase in the LRZ2 import level is rather low given the scale of the projects at issue. Additionally, we suggest that the new Tremval 345 kV switching station might be a good location for future installation of fast dynamic reactive-power injection to make better use of the new circuits in alleviating voltage-stability limits.	The 250MW increase referred to in the study analysis is one aspect of benefits provided and discussed in the Minnesota-Wisconsin area in Section 6 of the MTEP21 Addendum and not the sole determinant for moving that project forward as a recommended project. MISO agrees that Tremval may serve as a desirable location for reactive support, which is expected to become increasingly important as MISO moves into the LRTP Tranche 2 study analysis.

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Stakeholder comments	MISO response
Invenergy LLC Stakeholder Comment: Grain Belt Express – MISO's failure in Tranche 1 to consider how advanced stage merchant transmission projects interconnecting to MISO and its neighboring systems will be impacted by MISO's design of the LRTP projects and the resulting cost-benefit analysis.	As Invenergy LLC stated, MISO does have concern with including projects in our futures that do not have signed interconnection agreements, or representation in a state or utility IRP. MISO has committed to working with Invenergy on these concerns and developing an avenue for considering the Grain Belt Express project in a sensitivity study in the LRTP Tranche 2 process.
Missouri River Energy Services Stakeholder Comment: 1. 2030 ISD may need prioritization on importance 2. MISO needs a unified stance on Double Circuit capable lines 3. Lack of reactive support equipment or synchronous condensers	1. A 2030 tranche 1 portfolio in-service date is reasonable based on the information known at this time. Specific project in-service dates are an in-progress effort that MISO will refine prior to the MISO BOD approval. 2. MISO has considered and collected stakeholder feedback on where double circuit capability may be advantageous as individual projects are scoped. MTEP Appendix A will identify those facilities that should be capable of a second circuit in-line with the desire to maximize use of rights-of-way. 3. No reactive support devices were identified as part of Tranche 1. It is anticipated that reactive support will be further studied as part of Tranche 2.

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Stakeholder comments	MISO response
DTE Energy Stakeholder Comment: 1. Postage stamp cost allocation should be re-evaluated 2. Assumptions in MISO Futures are outdated 3. Lack of modeling transparency for stakeholders to thoroughly vet LRTP projects.	1. MISO's benefit/cost analysis represents a significant benefit to all MISO customers in the Midwest Subregion resulting in a cost allocation roughly commensurate with all economic and reliability benefits, including those customers in Cost Allocation Zone 7. 2. MISO agrees that over time (e.g., 2 to 3 years) certain elements of the Futures can evolve and should be evaluated to determine if there is benefit to updating certain information. MISO agrees it is timely to start that review with stakeholders soon. 3. MISO appreciates the suggestions provided by stakeholders in written comments and will continue efforts to improve the stakeholder LRTP experience going forward so that information is timelier and more beneficial for all stakeholders.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
Muni/Coop/TDU Sector Comment: 1. Use of inconsistent reference cases in evaluation of different benefits. 2. Robustness testing to evaluate alternative generation mix including storage was not performed. 3. All projects including rebuild of lower voltage facilities be fully described and any alternatives explored, before a meaningful review can be made.	1. The Congestion and Fuel Savings metric, Carbon Reduction, and the Avoided Capital Cost of Local Resource Investment assume that the Future 1 member plans and goals must be met; and that regional resource expansion requires the LRTP portfolio to be achieved. The Avoided Capital Cost benefit considers the cost of physical construction of resources without regard to deliverability while Congestion and Fuel Savings models the deliverability limitations to yield production cost savings and carbon emissions reductions made possible by the enablement of 20 GW of renewables by LRTP transmission 2. MISO has collaborated extensively with stakeholders in developing the Futures that are the basis for LRTP analysis. The reliability studies included additional transfer analysis scenarios to examine sensitivities to different assumptions in dispatch and resource availability. 3. Workshops did include discussions of project related upgrades and including Crandall – Willmarth at the Feb 25, 2022 meeting. A full list will be included in final report.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
Muni/Coop/TDU Sector Comment (cont'd): 4. Near term congestion should be included in determining appropriate projects including lower voltage/under-build facilities. 5. Sequencing of projects needs to be considered further to avoid adverse congestion during construction. 6. More context should be included in the report to include MVP usage rate and expected revenue requirements. 7. The cause operational events described in report content is not accurately attributed to increase in variable generation and aging plants.	4. LRTP projects are developed from a conceptual plan of solution ideas that guide the development of project candidates and associated facility upgrades where congestion may already exist. 5. MISO continues to work on establishing in-service dates and has been engaging Transmission owners in Rights of First Refusal States (ROFR). In service dates will be included in the final report 6. Additional information on estimate MVP usage rate and portfolio annual review requirements will be include din in the final report. 7. Operational events have increased in recent years as generation fleet has experience retirements of conventional generation with shift towards renewable resources and more use of Load Modifying Resources . The final report narrative will be revised to better clarify this point.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
Muni/Coop/TDU Sector Comment (cont'd): 8. Economic analysis used in evaluation of projects should be discussed in more detail and results made available. 9. Report should be revised to remove suggestion that stakeholders endorsed adoption of calculation methodology for Avoided Capital Costs of Local Resource Investment. 10. Future study phases should include anticipated upgrades on non-MISO facilities and other alternatives such as flow control. 11. Current inflation environment and cost of transmission construction should be considered in economic assessments.	8. Analysis of candidate projects considers economic performance in evaluating alternatives. For projects that provide same reliability performance economic analysis is used to determine whether a project shows economic advantages. Results of economic assessments was discussed at the Feb workshop and posted on Sharefile. 9. Calculation method to determine Avoided Capital Costs was revised by MISO and present to Stakeholders for discussion at workshops. Report narrative will be revised to clarify this point. 10. Evaluation of LRTP solutions includes consideration of alternatives submitted in the alternative solution window. MISO has discussed LRTP efforts with some external entities and will seek further engagement in the future. 11. Economic analysis and transmission cost estimates incorporate effects of long-term inflation. Inflation rate will continue to be monitored to assess any changes needed to reflect the ongoing trends

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
Eligible End Use Customers Sector Comment: 1. Consistent reference case was not used for forecasting Congestion and Fuel Savings, Decarbonization and Avoided Capital cost of Local Resources. 2. Calculation of forecasted Resource Adequacy Savings overstates the expected cost difference between capacity resource located within a local zone versus those located elsewhere in the MISO North/Central subregion.	1. The Congestion and Fuel Savings metric, Carbon Reduction, and the Avoided Capital Cost of Local Resource Investment assume that the Future 1 member plans and goals must be met, and that regional resource expansion requires the LRTP portfolio to be achieved. Avoided Capital Cost benefit considers the cost of physical construction of resources without regard to deliverability while Congestion and Fuel Savings models the deliverability limitations to yield production cost savings and carbon emissions reductions made possible by the enablement of 20 GW of renewables by LRTP transmission. 2. Resource Adequacy benefits captures a deferred generation investment savings and is not intended to represent cost savings in the future Planning Resource Auction. Cost of New Entry (CONE) is a proxy value used to reflect the value of the deferred costs.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
Eligible End Use Customers Sector Comment (cont'd): 3. Calculation of forecasted Avoided Risk of Load Shedding is greatly overstated by assuming subregion will experience firm loss every three years and LRTP will allow complete avoidance of such events.	3. Avoided Risk of Load Shedding metric captures the reliability/resiliency benefit from mitigating risks related to wide-area generation outages that result from severe winter weather. Severe winter weather patterns occurring at regular intervals is expected to have impacts on generation availability due to greater dependency on renewable resources in the future. Like other reliability benefits, the value is provided by reducing the amount of load shedding that results from all the contingent events rather than simply identifying and addressing the events with high probability of occurrence. While the Value of Lost Load (VOLL) currently reflected in market pricing is used to monetize the value of the benefit, other values for VOLL have been proposed that suggest the amount of benefit may be much higher.

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Stakeholder comments	MISO response
Environmental Sector Comment: 1. LRTP Report should present Tranche 1 result in context of more comprehensive LRTP process over coming years with specific timeframe and frequency for planning additional tranches. 2. More emphasis on reliability-based benefits including stability needs and urgency of addressing issues. 3. Resilience metrics do not accurately reflect the urgency of addressing climate risks and need for more robust, better connected and diverse grid. 4. Provide more clarity around the conservative approach used to give better perspective on the full range of benefits that result from considering additional climate change impacts, higher carbon costs, higher cost of local resource investment, benefits over the full 40-year book life of assets.	1. LRTP represents a multi-year approach to regional transmission planning and the first tranche of no-regrets projects serves a foundation for future work. MISO will continue to engage Stakeholders as work continues. 2. Reliability benefits capture the issues that are identified in the scope of analysis developed for Tranche 1. In future studies, MISO will explore further refinements in scope to identify other needs and quantify additional benefits. 3. The LRTP business case represents a broad set of metrics that show sufficient value to justify the transmission investment and represent the range of Stakeholder interests. 4. The LRTP business case recognizes that benefits may be subjective and are realized over a range of value. While MISO uses the minimum values to assess the benefit-to-cost ratio for regional cost sharing, the analysis does include a 40-year outlook and incorporates range of other variables.

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Stakeholder comments	MISO response
Iowa Office of Consumer Advocate Stakeholder Comment: 1. Current long term planning process is not particularly open and transparent for all users such as OCA. 2. Benefits are overstated. Economic benefits are based on hypothetical capital costs representing large share of LRZ 3 benefit and avoided capital costs assume unreasonable amount of resources not supported by goals of LRZ 3 utilities. 3. PV installed costs not based on known installed cost and little weight given to known projects in the GI queue. 4. Metrics should not include goals that are not required such as decarbonization.	1. MISO has implemented changes last year to expand access to entities such as OCA. Workshops were convened to provide an opportunity discuss study findings. 2. The Avoided capital costs represent the largest benefit overall and is allocated zonally based on load ratio share in direct proportion to the portfolio costs.. The Congestion and Fuel Savings metric, Carbon Reduction, and the Avoided Capital Cost of Local Resource Investment assume that the Future 1 member plans and goals must be met, and that regional resource expansion requires the LRTP portfolio to be achieved. Avoided Capital Cost benefit considers the cost of physical construction of resources without regard to deliverability while Congestion and Fuel Savings models the deliverability limitations to yield production cost savings and carbon emissions reductions made possible by the enablement of 20 GW of renewables by LRTP transmission. 3. The solar capital cost was sourced from NREL Annual Technology Baseline and adjusted to consider investment tax credit. MISO's Future siting process used 80% weighting preference toward GI queue when establishing siting for resource expansion. 4. While member goals and value placed on benefits like decarbonization may vary, the LRTP business case seeks to capture the value of a broad range of benefits that represent the diverse interests of our stakeholders.

Summary Comments and MISO Response
(See Appendix F for full verbatim)

Stakeholder comments	MISO response
MISO South TOs Stakeholder Comment: 1. Congestion and Fuel Savings and Avoided Capital Costs of Local Resources benefits overlap and not simultaneously achievable. 2. Non-LRTP future would require local expansion that would result in large excess of local capacity resulting in no Resource Adequacy benefits. 3. Approach used for Avoided Risk of Load Loss metric overestimates the benefit because value is monetized using VOLL and use of 100% probability of potential event and use of local and regional event scenarios is double counting of risks for certain zones.	1. The Congestion and Fuel Savings metric, Carbon Reduction, and the Avoided Capital Cost of Local Resource Investment assume that the Future 1 member plans and goals must be met, and that regional resource expansion requires the LRTP portfolio to be achieved. Avoided Capital Cost benefit considers the cost of physical construction of resources without regard to deliverability while Congestion and Fuel Savings models the deliverability limitations to yield production cost savings and carbon emissions reductions made possible by the enablement of 20 GW of renewables by LRTP transmission. 2. Resource Adequacy benefits captures a deferred generation investment savings and is not intended to represent cost savings in the future Planning Resource Auction. Cost of New Entry (CONE) is a proxy value used to reflect the value of the deferred costs. 3. Avoided Risk of Load Shedding metric captures the reliability/resiliency benefit from mitigating risks related to wide-area generation outages that result from severe winter weather. Severe winter weather patterns occurring at regular intervals is expected to have impacts on generation availability due to greater dependency on renewable resources in the future. Like other reliability benefits, the value is provided by reducing the amount of load shedding that results from all the contingent events rather than simply identifying and addressing the events with high probability of occurrence. While the Value of Lost Load (VOLL) currently reflected in market pricing is used to monetize the value of the benefit, other values for VOLL have been proposed that suggest the amount of benefit may be much higher.

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(See Appendix F for full verbatim)

Stakeholder comments	MISO response
MISO South TOs Stakeholder Comment (cont'd): 4. Decarbonization benefits should not be included because assumption should be that member goals are met in both reference case and LRTP future case. 5. Analysis data should be provided to validate methodology and conclusions including EGEAS LBA inputs. 6. Local resource investment should be analyzed on an LRZ rather than LBA basis.	4. Decarbonization benefits are associated with the reduction in carbon emissions observed in production cost simulations that result from the improved dispatch efficiency. Energy from renewable resources made deliverable by LRTP displaces the thermal resources that would otherwise be needed to address transmission constraints 5. EGEAS LBA expansion was developed with the same assumptions used in Future 1 scenario and data and assumptions disclosed publicly in the Futures development two years ago. Additionally, the PROMOD models based on same data and assumptions are available 6. The LBA expansion scenario was developed to establish the cost for resources that are strictly locally sited without the need to account for the cost of additional transmission to enable resources to be sited more broadly.

Questions